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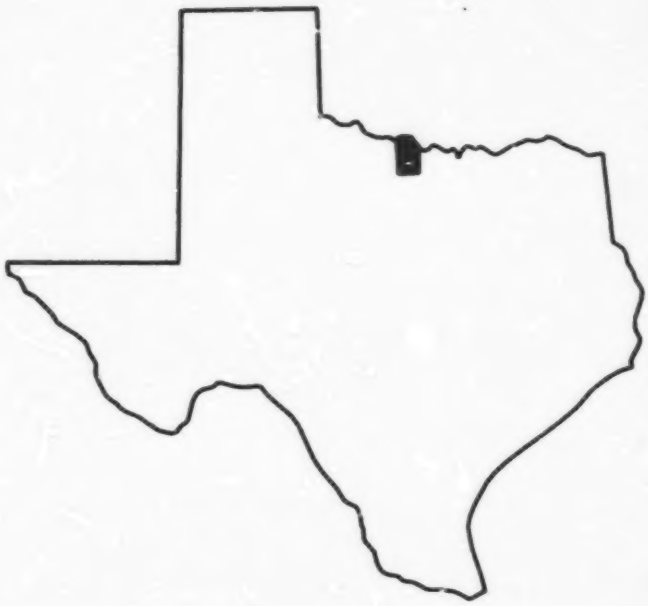
FLOOD INSURANCE STUDY

CITY OF HENRIETTA, TEXAS
CLAY COUNTY



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SEPTEMBER 30, 1988

COMPLETED

ORIGINAL

Federal Emergency Management Agency

COMMUNITY NUMBER - 480126

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance study purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
CITY OF HENRIETTA, CLAY COUNTY, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the City of Henrietta, Clay County, Texas. This information will be used by the City of Henrietta to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study represent a revision of the original analyses obtained from the Flood Plain Management Study for the City of Henrietta, which was prepared by the Soil Conservation Service (SCS) for the Federal Emergency Management Agency (FEMA). This study was updated by the SCS to include a floodway analysis for the Dry Fork of the Little Wichita River; this work was completed in July 1987.

1.3 Coordination

On February 24, 1986, the City of Henrietta was notified by FEMA of the initiation of a Flood Insurance Study for the community.

On August 21, 1986, a final Consultation and Coordination Officer's (CCO) meeting was held with representatives from FEMA and the City of Henrietta.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Henrietta, Clay County, Texas. The area of study is shown on the Vicinity Map (Figure 1).

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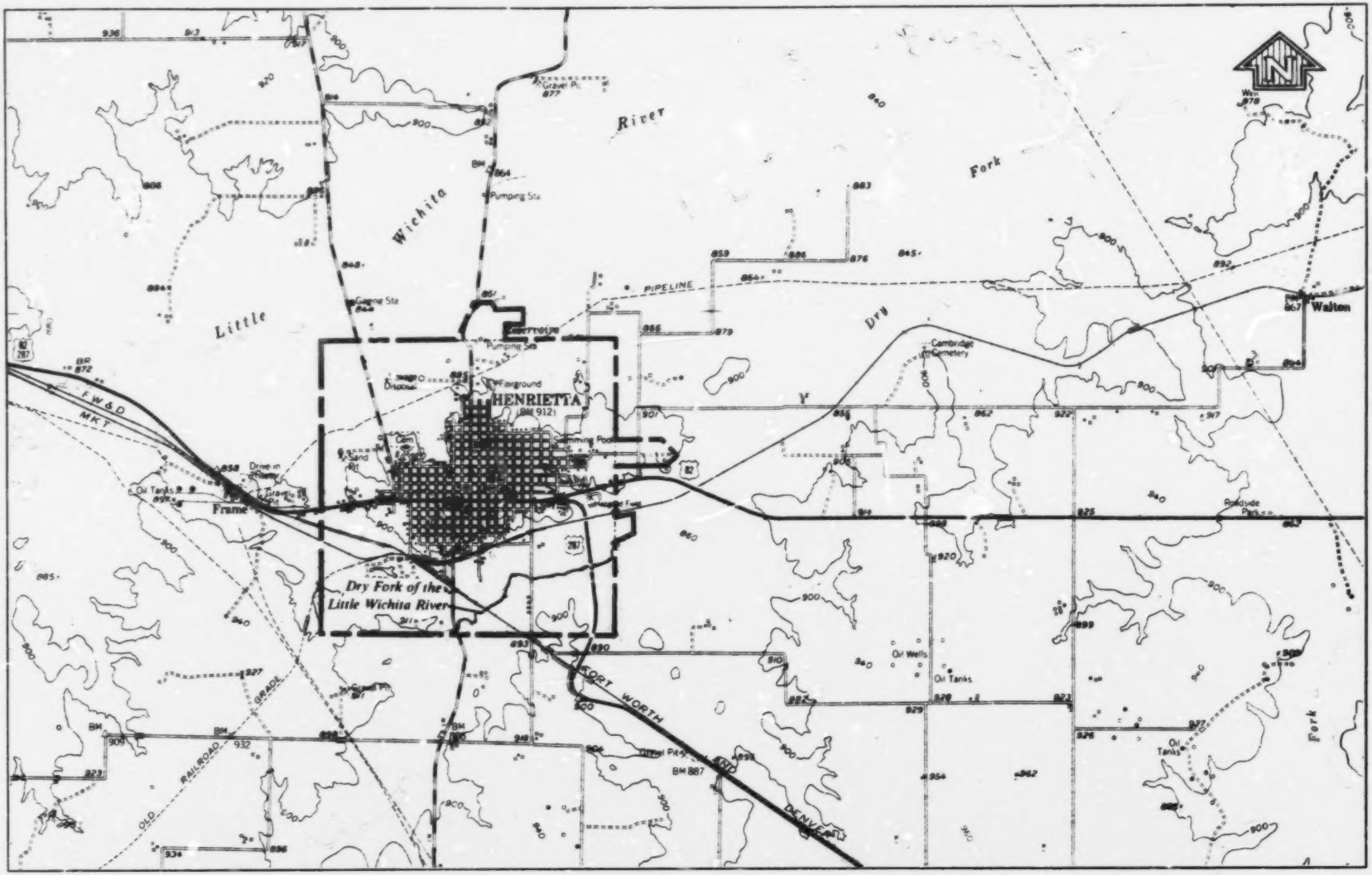


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HENRIETTA, TX
(CLAY CO.)

APPROXIMATE SCALE

1 0 1 2 3 MILES

VICINITY MAP

The Dry Fork of the Little Wichita River was studied by detailed methods for its entire length within the community. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development.

Flooding from the Little Wichita River affecting the community was studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

2.2 Community Description

The City of Henrietta lies in the northern portion of the Dry Fork of the Little Wichita River watershed and is entirely surrounded by Clay County.

The Dry Fork of the Little Wichita River watershed has a total area of 50.09 square miles (32,000 acres), an overall length of approximately 14 miles, and a maximum width of approximately 5.5 miles. The watershed slopes from southwest to northeast at approximately 18 feet per mile. The headwaters of the Dry Fork of the Little Wichita River are approximately 13 miles south-southwest of Henrietta. The river flows north and east through the southeast part of the city to its confluence with the Little Wichita River.

The average annual precipitation is 31.40 inches. Of this, an average of 20 inches, or 64 percent, falls from April to September, which includes the growing season for most crops. In two out of ten years, the rainfall from April to September is less than 15 inches. The heaviest one-day rainfall recorded at the Henrietta gage was 6.07 inches on June 23, 1959. Higher rainfall events have occurred on the watershed for longer durations; one recent example was the October 12-13, 1981, event. The rainfall ranged from 12.5 inches in the upper portion of the watershed to 7.5 inches at Henrietta during a 32-hour period.

2.3 Principal Flood Problems

The depth and velocity of floodwaters in the Dry Fork of the Little Wichita River watershed is an apparent threat to the lives of persons living in or traveling through the watershed. Floodwaters can damage residences, commercial properties, streets, roads, bridges, and railroad facilities and interrupt normal traffic patterns. Floodwaters also create potential health hazards, provide vector habitat, and cause many inconveniences that tend to lower the quality of life.

When the floodwaters recede, channels are laden with debris. This reduces the capacity of the channel and bridge openings, increasing the flood potential and endangering the bridges. The area inundated

by various frequency flood events is as follows: 10 percent chance, 680 acres; 4 percent chance, 720 acres; 2 percent chance, 740 acres; 1 percent chance, 780 acres; and 0.2 percent chance, 821 acres.

Major floods occur on an average of every 10 years. Individual accounts and stream gage records indicate that recent major floods occurred in 1941, 1947, 1954, 1972, and 1981. The most recent major flood occurred in October 1981. As a result of this flood, 27 residential properties were inundated causing estimated monetary damages of $540,810; ten commercial properties were flooded, resulting in damages of $1,115,770; and 200 workers were unemployed for approximately one week. In addition, crop and pasture damages were estimated to be $12,460.

In 1972, a storm of lesser magnitude, with approximately a 7 percent chance of occurrence, caused considerable damage. Extensive damage occurred to the Burlington Northern Railroad crossing of the Dry Fork of the Little Wichita River when a mobile home was carried by floodwater and lodged in the bridge opening. This caused a breach in the bridge abutment and, consequently, interrupted the railroad traffic for days. The abutment was repaired to its original condition, allowing the possibility of this occurring again as the bridge is frequently overtopped by flood flows.

2.4 Flood Protection Measures

There are no flood protection measures in the community at the time of this study.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding source studied in detail affecting the community.

Rainfall frequency data were obtained from Technical Paper No. 40 (Reference 1). Peak discharge values were determined by flood routing various storm frequencies with a 24-hour rainfall duration using SCS Technical Release No. 20 (Reference 2).

A summary of the drainage area-peak discharge relationships for the Dry Fork of the Little Wichita River is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
DRY FORK OF THE LITTLE WICHITA RIVER Downstream of Burlington Northern Railroad	46.80	6,498	12,326	15,924	24,196

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data for the backwater analyses were obtained from field surveys. Cross sections were taken at close intervals above and below bridges and culverts in order to compute the significant backwater effects of these structures.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the SCS WSP-2 computer program (Reference 3). Using the output data from this program, rating curves were plotted for each cross section. These curves show the relationship between stage or elevation and discharge. Water-surface profiles were developed from these rating curves and

the computer results of TR-20 routings. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for the Dry Fork of the Little Wichita River were determined using the modified slope/area method.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:62,500 with a contour interval of 10 feet and aerial photographs at a scale of 1:6,000 (References 4 and 5).

For the streams studied by approximate methods, the 100-year flood boundaries were delineated using the Flood Hazard Boundary Map for the City of Henrietta (Reference 6).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above

the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this study is presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this study was computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodway is shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway widths for the Dry Fork of the Little Wichita River extend beyond the corporate limits.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Dry Fork of the Little Wichita River								
A	-700	902[2]	7,697	2.0	866.0	866.0	867.0	1.0
B	1,110	906	7,355	2.1	867.6	867.6	868.6	1.0
C	1,220	840	7,082	2.2	868.2	868.2	869.1	0.9
D	2,300	913	7,572	2.1	869.0	869.0	870.0	1.0
E	3,450	963	7,665	2.1	870.0	870.0	870.9	0.9
F	3,550	1,094	8,447	1.9	870.3	870.3	871.2	0.9
G	5,225	882	6,410	2.5	872.4	872.4	873.3	0.9
H	5,950	881	6,849	2.3	873.2	873.2	874.1	0.9
I	6,070	306	3,120	5.1	875.4	875.4	875.9	0.5
J	7,220	1,028	9,932	1.6	876.0	876.0	877.0	1.0
K	7,325	334[3]	3,430	4.7	877.5	877.5	877.9	0.4
L	7,860	755[3]	6,368	2.4	877.7	877.7	878.7	1.0

[1] Feet from corporate limits
[2] This width lies entirely outside corporate limits
[3] This width extends beyond corporate limits

TABLE 2

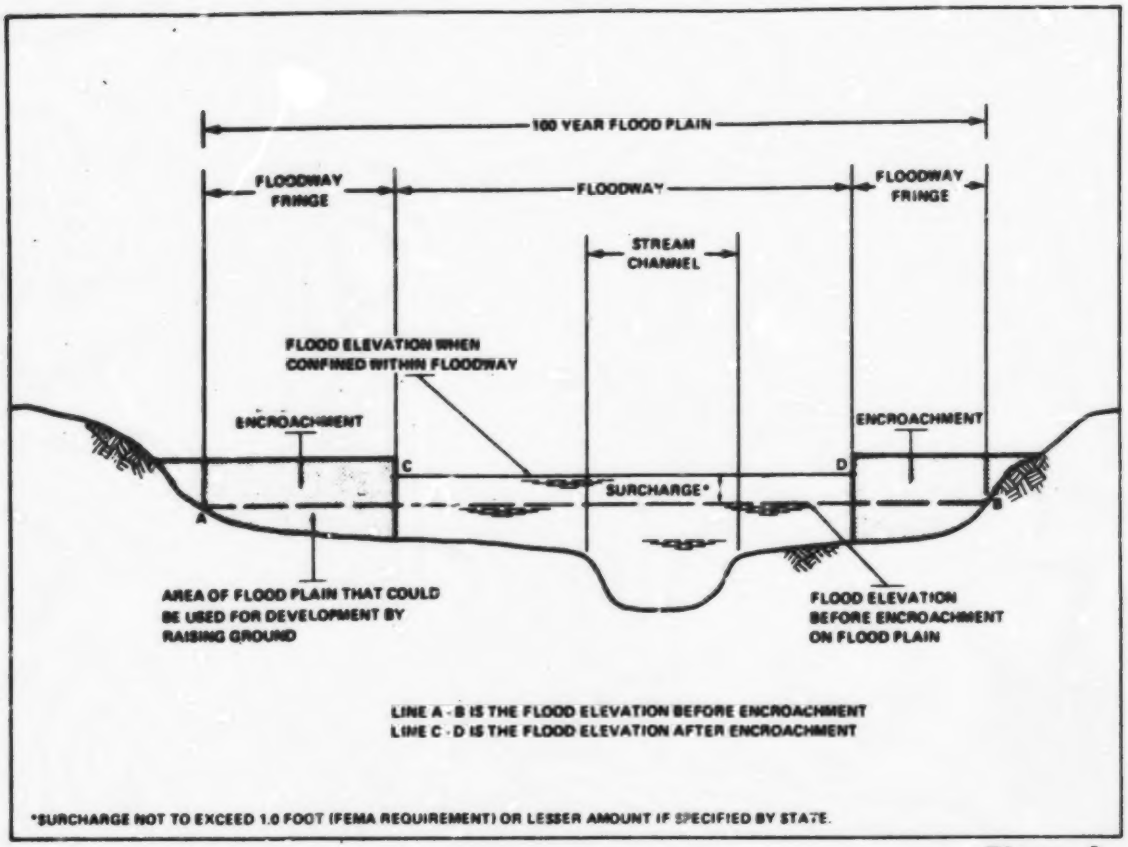
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HENRIETTA, TX

(CLAY CO.)

FLOODWAY DATA

DRY FORK OF THE LITTLE WICHITA RIVER


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC

Figure 2

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

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Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

7.0 OTHER STUDIES

Due to its more detailed nature, this Flood Insurance Study supersedes the Flood Hazard Boundary Map for the City of Henrietta (Reference 6).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Federal Regional Center, 800 North Loop 288, Denton, Texas 76201.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, Washington, D. C., 1961, Revised 1963.

2. U. S. Department of Agriculture, Soil Conservation Service, Technical Release No. 20, Computer Program, Project Formulation, Hydrology, Washington, D. C., March 1969.

3. U. S. Department of Agriculture, Soil Conservation Service, Technical Release No. 61, WSP-2 Computer Program, Washington, D. C., May 1976.

4. U. S. Department of the Interior, Geological Survey, 15-Minute Series Topographic Maps, Scale 1:62,500, Contour Interval 10 Feet: Henrietta, Texas.

5. U. S. Department of Agriculture, Soil Conservation Service, Dry Fork of The Little Wichita River Flood Plain Management Study, aerial photographs, Scale 1:6,000: Clay County, Texas, July 1984.

6. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Henrietta, Clay County, Texas, June 11, 1976.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	Elevation (Feet NGVD)	Description of Location
RM 1	870.06	Head of 60d nail in west base of power pole of west side on Hancock Road approximately 1,500 feet south of Omega.
RM 2	366.06	Chiseled square on northeast end U. S. Business Highway 287 bridge over the Dry Fork of the Little Wichita River.

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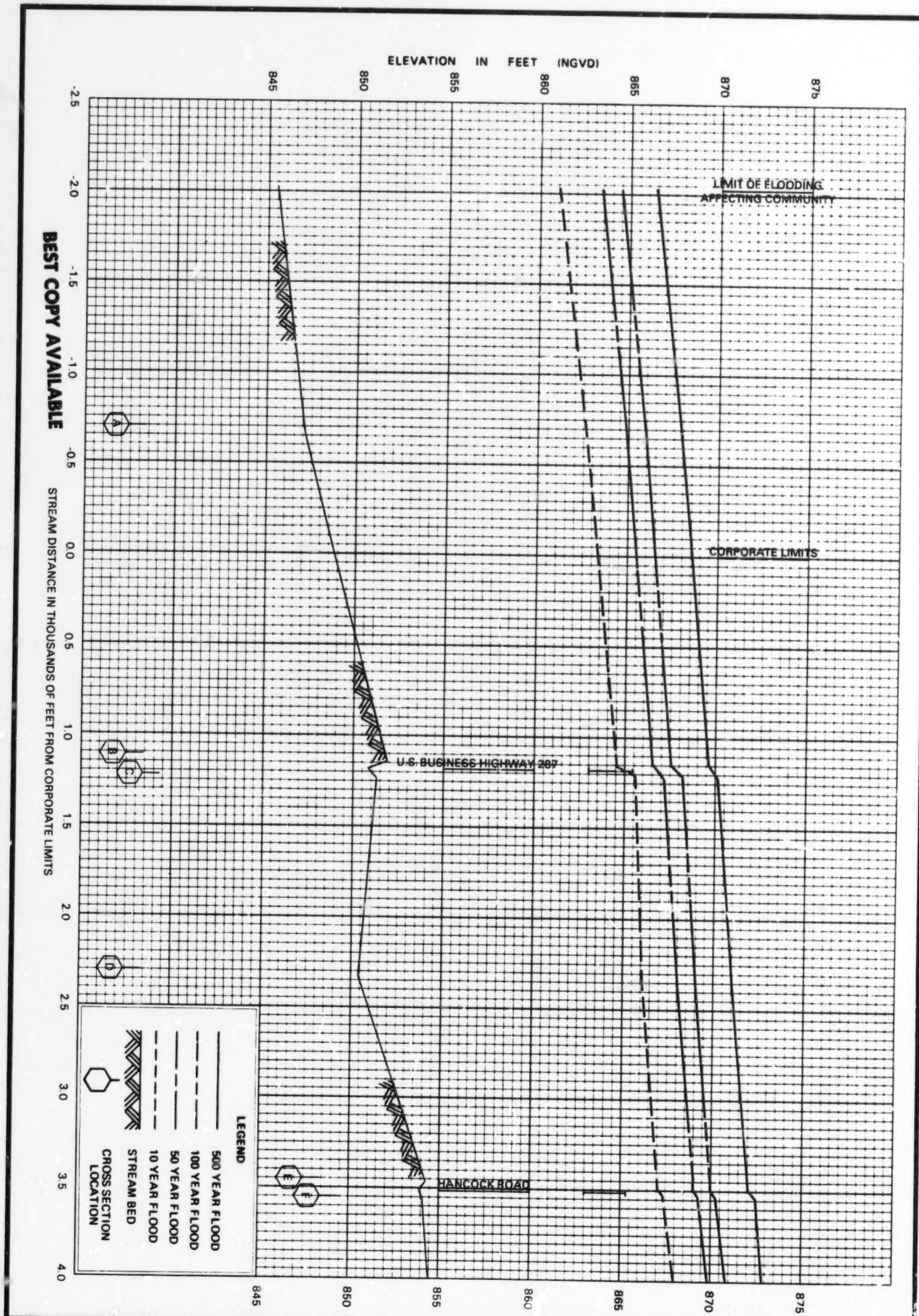

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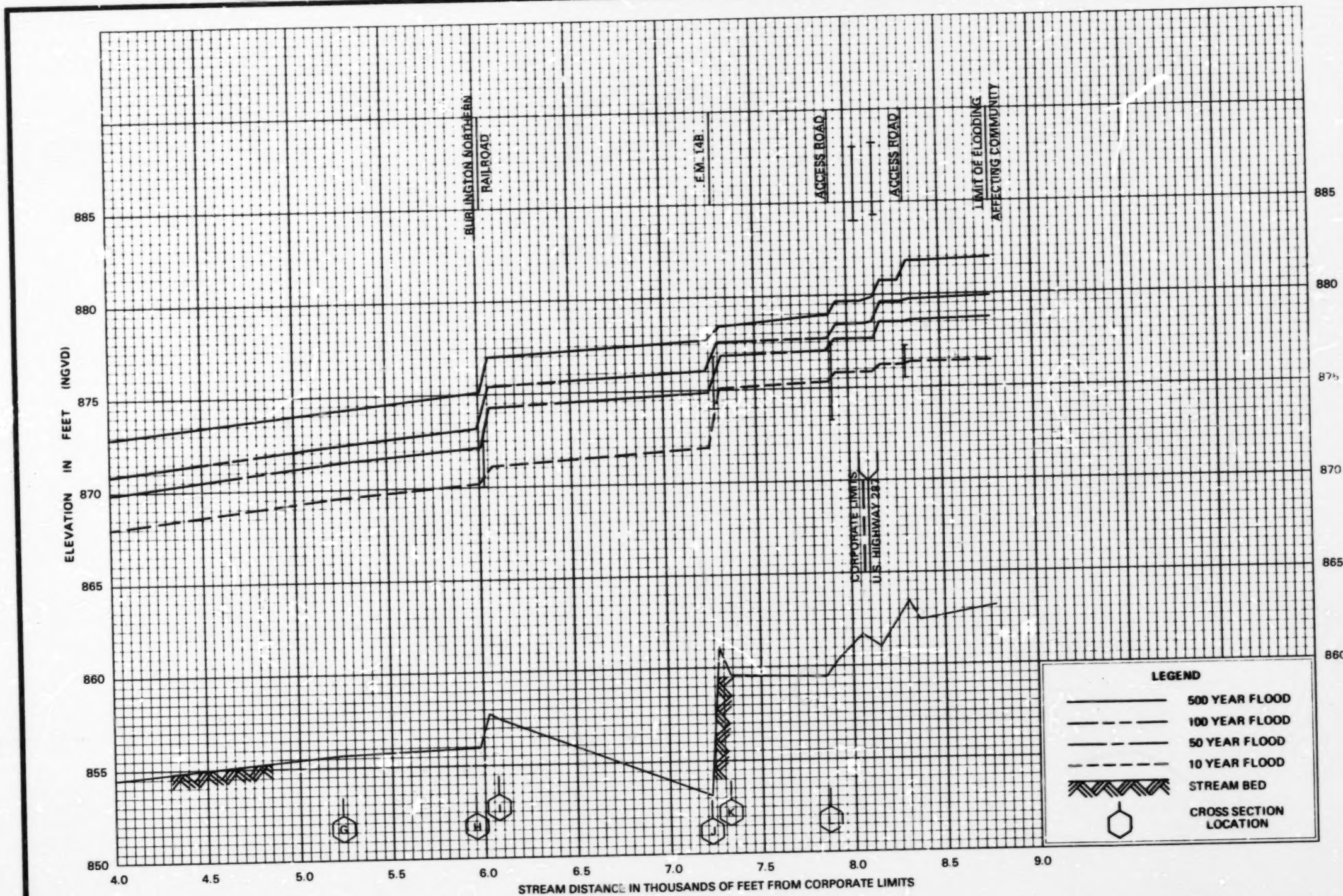
01P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF HENRIETTA, TX (CLAY CO.)	FLOOD PROFILES DRY FORK OF THE LITTLE WICHITA RIVER



FLOOD PROFILES

DRY FORK OF THE LITTLE WICHITA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HENRIETTA, TX
(CLAY CO.)

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